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THE PLANT DISEASE REPORTER

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THE PLANT DISEASE SURVEY

Division of Mycology and Disease Survey
BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING
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SUPPLEMENT 182

FUNGICIDAL AND PHYTOTOXIC PROPERTIES OF 506 SYNTHETIC ORGANIC COMPOUNDS

Supplement 182 March 30, 1949

The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

PLANT DISEASE REPORTER SUPPLEMENT

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THE PLANT DISEASE SURVEY
DIVISION OF MYCOLOGY AND DISEASE SURVEY

Plant Industry Station Beltsville, Maryland

FUNGICIDAL AND PHYTOTOXIC PROPERTIES OF 506 SYNTHETIC ORGANIC COMPOUNDS[1]

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For a number of years the Division of Insecticide Investigations of the Bureau of Entomology and Plant Quarantine has been preparing synthetic organic compounds for studies of their insecticidal properties. Since 1938 the Bureau of Plant Industry, Soils, and Agricultural Engineering has cooperated in the preliminary testing of many of these compounds for their fungicidal properties. The studies presented in this paper represent the results of such tests made during the years 1938 to 1946. The primary object of these studies was to discover synthetic organic chemical compounds that could be used in a practical manner in orchards and in field plots. It was hoped that compounds would be found that were noninjurious to the host plants and could be substituted for the more injurious and commonly used sulfur and copper fungicides. These studies have not taken into account the possibilities of the compounds when used to combat soil- and seed-borne fungus parasites, organisms that destroy stored food, or organisms that cause deterioration of fabrics and lumber; and they have not indicated to what extent the materials may be useful as bactericides, hormones, or weed killers.

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[1] The Plant Disease Survey recognizes that the material presented in this Supplement differs from the usual content of the Plant Disease Reporter, and may not be of direct interest to many of its readers. It is issued as a special contribution because of its fundamental importance. The Survey does not assume responsibility for the subject matter. The expense of publication is borne by the Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering. P.R.M.

MATERIALS AND METHODS

Most of the compounds discussed in this report are solids practically insoluble in water. These materials were selected because fungicides, in order to be effective under field and orchard conditions, must remain on the plants from one spray application to the next. This period varies for different crop plants from one to several weeks. Generally speaking, water-soluble materials deposit thin layers of toxicant, which are removed easily from plant surfaces by rain. Such water-soluble chemicals are useful as eradicators against a limited number of organisms. For a chemical to be considered as a protective fungicide it must be slowly soluble and non-injurious to the host plants, and it must remain as a residue on the plant surface for at least 10 to 14 days.

The methods developed for screening compounds as fungicides are based upon the foregoing requirements. The steps taken in the determination of fungicidal and phytotoxic properties of a compound are shown in the diagram opposite (Figure 1).

In all tests the material, after being properly ground, was suspended in water. If a wetting agent was needed, several drops of a solution of one-half ounce of an alkyl aryl sulfonate (Santomerse S) in 100 gallons of water were used.

The formulations varied with the period when the tests were conducted. When the tests were begun, in 1938, the newer synthetic insecticides were not in use. It was then necessary to consider the compatibility of the compounds with the adjuvants ordinarily used when lead arsenate was employed as the insecticide. Because of this, lime[2] or lime plus bentonite was frequently added to the compound tested. When the synthetic organic insecticides came into use, this step was not necessary. A grinding agent, such as pyrophyllite, was frequently added to help suspend the compounds.

After the compound to be tested was properly suspended in water, it was used as a spray on plants and also for the preparation of deposits simulating spray residues on leaves. These residues were to be used in testing their toxicity to the conidia of the fungi that cause peach brown rot (Monilinia fructicola (Wint.) Honey) and apple bitter rot (Glomerella cingulata (Ston.) Spauld. and Schrenk).

The spraying of the plants (peach) was done with a hand-operated spray gun or a paint gun connected with a portable air compressor. The small limbs or small plants were completely covered with the spray. The pressure never exceeded 40 pounds per square inch; so none of the plants were mechanically injured.

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[2] Hydrated lime used.

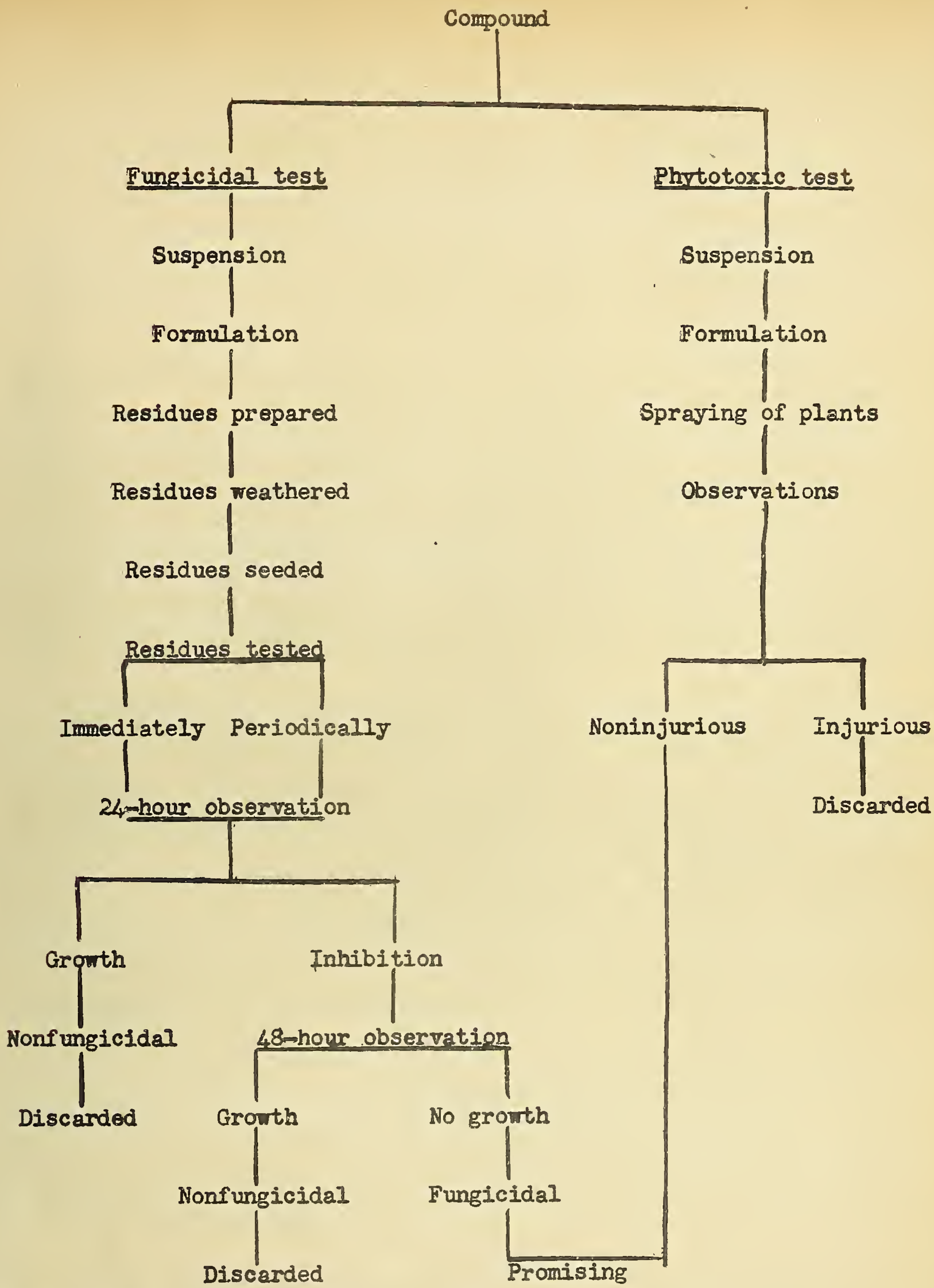

Figure 1. Diagram showing steps taken in the determination of fungicidal and phytotoxic properties of chemical compounds.

The deposits were prepared as follows: The suspension was transferred to clean glass cover slips, 25 by 50 mm., by means of a standard stirring rod, as described by Peterson.[3] The glass rod acted both as a stirrer and as a transfer agent. A small droplet of the suspension, not more than three-sixteenths of an inch in diameter, was centered on each half of the cover slip and allowed to dry out to form a residue. Eight such cover slips were made from each suspension. Each suspension had its own surface-tension effect upon the glass surface; therefore the droplets differed slightly. However, within the series of slides made up from any one suspension the areas covered were fairly uniform.

The next step was to test the residues for weathering properties. This was done by tying among the leaves of orchard trees special holders for the cover slips. Holders were made by fastening wooden pot labels to clip clothespins, the jaws of which were lined with cork. These clothespins held the glass cover slips in place, while the wooden pot labels protected them against breakage. Under these conditions the cover slips were subjected naturally to the varying environments of the tree. The residues were thus exposed usually for 14 days. After each 2-day period, or 3 days over week ends, 1 cover slip and its weathered residue was removed from the tree and taken to the laboratory. Each test consisted of samples of 25 different compounds hung among the leaves of a single large apple tree.

After the samples were brought into the laboratory, they were tested for their fungicidal effectiveness. The cover slips were cut into two parts, each of which then contained a single area of weathered residue. One half was seeded, by means of a uniform platinum loop, with a standardized suspension of the conidia of Monilinia fructicola and the other half with a standardized suspension of the conidia of Glomerella cingulata. The cover glasses with the seeded residues were then inverted over Van Tieghem cells (small glass humidity chambers) but were not sealed to them because the conidia needed oxygen for germination. Immediately the Van Tieghem cells with the cover slips were placed in large glass culture chambers, which were then sealed with water. The air trapped on the large culture chambers was thus available to the conidia.

To insure further that the supply of oxygen and nutrients was ample, the conidial suspensions were made up in distilled water, to which a synthetic nutrient solution (Czapek) was added at the rate of 1 ml. to each 10 ml. of distilled water. The suspension was diluted so that not more than 150,000 cells of the peach brown rot organism or more than 200,000 cells of the apple bitter rot organism occupied each milliliter of their respective medium.

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[3] Peterson, P. D. The spore-germination method of evaluating fungicides. Phytopathology 31: 1108-1116. 1941.

The conidia seeded in the residues were incubated for 24 hours at 70° F. The reaction of the conidia to the chemicals was then observed under the microscope. If the conidia germinated, this was recorded and the conidia were discarded; otherwise they were recorded as being inhibited. Since the authors were not certain that the conidia had been injured, those inhibited were then transferred to the surface of nutrient agar to which no test chemical had been added. This was done by using a small piece of the agar surface as a sponge to soak up the conidia from the residue and place them in contact with the nutrient agar. The conidia were then incubated on the new surface for another 24-hour period at 70°. After a microscopic observation, a record was made as to whether they had been injured. Since the authors were concerned only with chemicals that kill and not with those that inhibit, a chemical was recorded as being a fungicide only when it killed all the conidia subjected to the test. Inhibition has been commonly encountered in these tests, and many of the chemicals examined appeared to cause a slight disturbance in the environment surrounding the conidia, which in no way was found to be deleterious.

With the methods and the intervals of time used, it was possible to obtain, at the most, six observations on the performance of any given chemical during a 14-day test period. Sometimes periods of excessive drought or rainfall were encountered. If a chemical showed a fungicidal property under these conditions, it was usually tested further. The fungicidal values shown in the tables were obtained from those tests that provided the most favorable response during one or more test periods.

Chemicals reacting favorably in both the fungicidal and the phytotoxic tests were selected as the most promising materials. To be of practical value the compound must be not only a good fungicide, but also stable, safe to handle, and noninjurious to the plants sprayed.

RESULTS

The compounds tested during the years 1938 to 1946 and their fungicidal effects on the conidia of Monilinia fructicola and Glomerella cingulata are given in tables 1 to 4. The phytotoxic effects of the materials on peach plants are shown in tables 2, 3, and 4.

The greatest number of chemicals (459) showed no fungicidal action (table 1). Most of these compounds also had no phytotoxic effect; and therefore results of these tests were omitted from the table.

The compounds found to show some fungicidal activity are listed in table 2. Phytotoxic effect and duration of the fungicidal action in the 14-day test period are also indicated. Of 47 compounds having fungicidal properties, 33 were found to cause some degree of plant injury and therefore were of no value for our specific purposes. Of these compounds, 11 were found to possess fungicidal action for only 1 or 2 days. It is thought that this rapid change in toxicity may be due to the loss of some volatile contaminating reaction product or to a rapid break-down of a rather unstable combination. Whatever the rason, such compounds are not useful as fungicides.

Only a few of the compounds appeared to show much promise, and these were tested further in mixtures with adjuvants and insecticides. The data for the tests are shown in table 3. Several of the promising organic acids - adipic, anisic, and p-chlorobenzoic - when mixed with lime lost their fungicidal properties. Adipic acid became extremely phytotoxic and lost its fungicidal property when mixed with nicotine-bentonite, but the fungicidal property of anisic acid was enhanced in this mixture. In general, the addition of lime to the organic acids caused them to lose their fungicidal properties and to become more injurious to the sprayed plants. Addition of lime appeared to lower the fungicidal value of benzamide, benzimidazole, and p,p'-thiodianiline. The chlorinated hydroxy aliphatic compounds appeared to be markedly affected physically by the addition of lime; yet their fungicidal properties were not changed. None of the compounds appeared to be changed in any of their characteristics by the addition of pyrophyllite.

Compounds possessing the least phytotoxic behavior and having the most promising fungicidal properties were p-chloro-alpha-isonitroso acetanilide, p-chlorobenzoic acid, 3,4-dichlorobenzoic acid, benzimidazole, benzamide, N-(o-methoxyphenyl) glycinonitrile, p,p-thiodianiline, 2,2'-methylenebis [4-chlorophenol], 2,2'-(2,2,2-trichloroethylidene)bis[4-chlorophenol], and 4,4'-isopropylidenediphenol. Of these 2,2'-methylenebis[4-chlorophenol] and 3,4-dichlorobenzoic acid were used more extensively in further tests. Table 4 shows some of the mixtures used with those two compounds and the effect of these mixtures on their fungicidal and phytotoxic behavior.

SUMMARY

Data are presented on the effect of 506 synthetic organic compounds, when used as fungicides, on the conidia of Monilinia fructicola (Wint.) Honey, the pathogen that causes the well-known peach brown rot disease, and Glomerella cingulata (Ston.) Spauld. and Schrenk, the pathogen that causes the disease of apples known as bitter rot.

Of these compounds 456 failed to show any fungicidal effect on either organism, but 47 of them were found to be toxic to the conidia of the 2 fungi in some degree. The toxicity, however, of most of these compounds was so slight that they are of no real value as orchard or field fungicides. Many of these were also found to be toxic to peach foliage and were, therefore, useless as fungicides.

The 10 organic compounds which appeared to be the most promising as fungicides were the following:

1. Acetanilide, p-chloro-alpha-isonitroso-
2. Aniline, p,p'-thiodi-
3. Benzamide
4. Benzimidazole
5. Benzoic acid, p-chloro-
6. Benzoic acid, 3,4-dichloro-
7. Glycinonitrite, N-(o-methoxyphenyl)-
8. Phenol, 2,2'-methylenebis [4-chloro-
9. Phenol, 2,2'-(2,2,2-trichloroethylidene)bis[4-chloro-
10. Phenol, 4,4'-isopropylidenedi-

These organic compounds appear to possess satisfactory fungicidal properties, apparently are stable when mixed with insecticides, lime and adjuvants, and appear safe to use on tender peach foliage.

Table 1.--Organic compounds showing no fungicidal action when applied as sprays formulated with and without adjuvants

Compound[1]	Pounds per 100 gallons	Adjuvant[2]
Acetamide, N-anilino-alpha-phenyl-	1	B
Acetamide, 4-anilino-N,N'-phenylenebis-	2	O
Acetamide, alpha-ethyl-alpha-phenyl-	2	B
Acetanilide, m-chloro-alpha-(pentachlorophenoxy)-	1	B
Acetanilide, p-cyclohexylsulfamyl-	1	B
Acetanilide, p-(diethylsulfamyl)-	2	B
Acetanilide, m-hydroxy-	2	B
Acetanilide, o-hydroxy-	2	B
Acetanilide, p-hydroxy-	2	B
Acetanilide, alpha,alpha,alpha-2,5-pentachloro-	1	B
Acetanilide, p-(propylsulfamyl)-	2	B
Acetanilide, p,p'-sulfonylbis-	2	O
Acetic acid, 2,4-dinitrophenyl ester	2	C
Acetic acid, 2-phenylhydrazide	1	B
Acetic acid, alpha-(trichloromethyl) ester	1	B
Acetoacetanilide, o-chloro-	2	B
Acetoacetic acid, ethyl ester, semicarbazone	2	B
Acetonitrile, alpha-anilinophenyl-	1	B
Acetonitrile, alpha-(o-anisidino)phenyl-	1	B
Acetonitrile, alpha-(p-bromoanilino)phenyl-	1	B
Acetonitrile, alpha-(p-toluino)phenyl-	1	B
Acetophenone, semicarbazone	2	B
Acetophenone, p-chloro-, semicarbazone	2	B
Acetophenone, 3,4-dichloro-, semicarbazone	2	B
Acetophenone, p-hydroxy-	2	O
Acetophenone, p-methyl-, semicarbazone	2	B
Aniline, N-amyl-2,4-dinitro-	2	B
Aniline, N-butyl-2,4-dinitro-	2	B
Aniline, N,N-diethyl-2,4-dinitro-	2	B
Aniline, N,N-diisobutyl-2,4-dinitro-	2	B
Aniline, 2,4-dinitro-N-propyl-	2	B
Aniline, N-ethyl-2,4-dinitro-	2	B
Aniline, N-isobutyl-2,4-dinitro-	2	B
Aniline, N-isopropyl-2,4-dinitro-	1	B
Aniline, N-methyl-2,4-dinitro-	2	B
Aniline, p,p'-methylenedi-	1	B
Aniline, p,p'-oxydi-	2	O
Aniline, p,p'-sulfonyldi-	2	O
p-Anisidine	2	O
o-Anisidine, 5-chloro-	2	B
Anisole, 4-chloro-2-nitro-	2	B
Anisole, 2,4-dinitro-	2	C
9,10-Anthradiol, diacetate	2	O
Anthraquinone, 2-benzamido-	2	O

Footnotes on p. 105

Table 1.—Organic compounds showing no fungicidal action when applied as sprays formulated with and without adjuvants - Continued

Compound[1]	Pounds per 100 gallons	Adjuvant[2]
Anthraquinone, 2-bromo-	2	O
Anthranilic acid, N-ethoxyoxalyl-	2	O
Anthranilic acid, N,N'-oxalylbis-	2	O
2-Anthroic acid	1	B
Barbituric acid	2	O
Benzaldehyde, phenylhydrazone	2	B
Benzaldehyde, semicarbazone	2	B
Benzamide, N-amyl-*m*-nitro-	1	B
Benzamide, N-amyl-*p*-nitro-	1	B
Benzamide, N-sec-butyl-	2	O
Benzamide, N-butyl-*m*-nitro-	1	B
Benzamide, N-sec-butyl-*m*-nitro-	1	B
Benzamide, N-butyl-*p*-nitro-	1	B
Benzamide, N-sec-butyl-*p*-nitro-	1	B
Benzamide, N-cyclohexyl-*m*-nitro-	1	B
Benzamide, N,N-dibenzyl-	2	O
Benzamide, N-(2,5-dichlorophenyl)-N,N'-ethylenebis-	1	B
Benzamide, N,N-dicyclohexyl-	2	O
Benzamide, N,N-dicyclohexyl-*m*-nitro-	1	B
Benzamide, N,N-diethyl-*p*-nitro-	1	B
Benzamide, N,N-diisobutyl-	2	O
Benzamide, N,N-diisobutyl-*p*-nitro-	1	B
Benzamide, N,N-diisopropyl-	2	O
Benzamide, N,N-diisopropyl-*p*-nitro-	1	B
Benzamide, N,N-dimethyl-*m*-nitro-	1	B
Benzamide, N,N-dimethyl-*p*-nitro-	1	B
Benzamide, N,N-diphenyl-	2	O
Benzamide, N-hydroxymethyl-	1	B
Benzamide, N-isobutyl-*m*-nitro-	1	B
Benzamide, N-isobutyl-*p*-nitro-	1	B
Benzamide, N-isopropyl-	2	O
Benzamide, N-isopropyl-*m*-nitro-	1	B
Benzamide, N-isopropyl-*p*-nitro-	1	B
Benzamide, N-(1-methylamyl)-	2	O
Benzamide, N,N'-methylenebis-	1	B
Benzamide, N-methyl-*m*-nitro-	1	B
Benzamide, N-methyl-*p*-nitro-	1	B
Benzamide, *p*-nitro-N,N-dipropyl-	1	B
Benzamide, *m*-nitro-N-propyl-	1	B
Benzamide, *p*-nitro-N-propyl-	1	B
Benzamide, N,N'-*m*-phenylenebis-	2	O
Benzamide, N,N'-*p*-phenylenebis-	2	O
Benzamide, N-[2,2,2-trichloro-1-(hydroxyethyl)]-	1	B
Benzanilide, N-benzyl-	2	O
Benzanilide, 2'-bromo-	2	O
Benzanilide, 3'-bromo-	2	O

Footnotes on p. 105

Table 1.—Organic compounds showing no fungicidal action when applied as sprays formulated with and without adjuvants - Continued

Compound[1]	Pounds per 100 gallons	Adjuvant[2]
Benzanilide, 4'-bromo-	2	0
Benzanilide, 2'-chloro-	1	0
Benzanilide, 3'-chloro-	2	0
Benzanilide, 4'-chloro-	2	0
Benzanilide, 2'-chloro-3-nitro-	1	B
Benzanilide, 3'-chloro-3-nitro-	1	B
Benzanilide, 2',5'-dichloro-	2	0
Benzanilide, N-(1-naphthyl)-	2	0
Benzanilide, N-(2-naphthyl)-	2	0
Benzanilide, 2'-nitro-	2	0
Benzanilide, 3-nitro-	1	B
Benzanilide, 3'-nitro-	2	0
Benzanilide, 4'-nitro-	2	0
Benzanilide, *o*-phenyl-	2	0
o-Benzanisidide	2	0
p-Benzanisidide	2	0
Benzene, alpha,beta-dibromoethyl-	2	A
Benzene, 1,4-dichloro-2-nitro-	2	0
Benzene, 1-iodo-2-nitro-, dichloride	2	A
Benzene, 1-iodo-3-nitro-, dichloride	2	A
Benzene, 1-iodo-4-nitro-, dichloride	2	A
Benzene, 1-iodoso-2-nitro-	2	A
Benzene, 1-iodoso-4-nitro-	2	A
Benzenesulfonamide, N-(*p*-anisyl)-*p*-bromo-	2	0
Benzenesulfonamide, N-benzyl-	2	0
Benzenesulfonamide, *p*-bromo-N,N-dimethyl-	2	0
Benzenesulfonamide, *p*-bromo-N-ethyl-	2	0
Benzenesulfonamide, *p*-bromo-N-isobutyl	2	0
Benzenesulfonamide, *p*-bromo-N-propyl-	2	0
Benzenesulfonamide, *p*-bromo-N-(*p*-tolyl)-	2	0
Benzenesulfonamide, N-sec-butyl-	2	0
Benzenesulfonamide, N-butyl-*p*-chloro-	2	0
Benzenesulfonamide, *p*-chloro-N-propyl-	2	0
Benzenesulfonamide, N,N'-ethylenebis-	2	0
Benzenesulfonanilide, 4,4'-dibromo-	2	B
o-Benzenesulfonanisidide	2	B
Benzenesulfonic acid, *p*-bromophenyl ester	1	B
Benzenesulfonic acid, *o*-chlorophenyl ester	1	B
Benzenesulfonic acid, 2,4-dinitrophenyl ester	1	B
Benzenesulfonic acid, 1-naphthyl ester	1	B
Benzenesulfonic acid, 2-naphthyl ester	1	B
Benzenesulfonic acid, *m*-nitrophenyl ester	1	B
Benzenesulfonic acid, *o*-nitrophenyl ester	1	B
Benzenesulfonic acid, *m*-tolyl ester	1	B
Benzenesulfonic acid, *p*-tolyl ester	1	B
Benzenesulfonic acid, 4-tert-butyl-2-chlorophenyl ester	1	B

Footnotes on p. 105

Table 1.—Organic compounds showing no fungicidal action when applied as sprays formulated with and without adjuvants - Continued

Compound[1]	Pounds per 100 gallons	Adjuvant[2]
Benzenesulfonic acid, p-tert-butylphenyl ester	1	B
Benzenesulfonic acid, 2,4,6-trichlorophenyl ester	1	B
Benzenesulfonic acid, xenyl ester	1	B
o-Benzenesulfonophenetidide	2	B
m-Benzenesulfonotoluidide	2	0
o-Benzenesulfonotoluidide	2	0
Benzil, semicarbazone	2	B
1,3-Benzisoxazine, 4-cyano-2,4-dihydro-2-(o-hydroxyphenyl)-3-phenyl-	1	B
1,3-Benzodioxan, 2,4-bis(trichloromethyl)-6-nitro-	1	B
Benzofuro[3,2-b]benzofuran, 2,7-diol,4b,9b-diphenyl-	2	0
Benzofuro[3,2-b]benzofuran, 2,7-diol,4b,9b-diphenyl, diacetate	2	0
Benzofuro[3,2-b]benzofuran, 2,7-diol,4b,9b-diphenyl, dipropionate	2	0
Benzoic acid	2	0
Benzoic acid, p-benzamido-, ethyl ester	2	0
Benzoic acid, o-bromo-	2	0
Benzoic acid, 4-tert-butylphenyl ester	1	B
Benzoic acid, 4-chlorophenyl ester	1	B
Benzoic acid, p-nitro-, benzyl ester	1	B
Benzoic acid, p-nitro-, p-bromophenyl ester	1	B
Benzoic acid, p-nitro-, 2-chloroethyl ester	1	B
Benzoic acid, p-nitro-, o-chlorophenyl ester	1	B
Benzoic acid, p-nitro-, p-chlorophenyl ester	1	B
Benzoic acid, p-nitro-, cyclohexyl ester	1	B
Benzoic acid, p-nitro-, 2,4-dinitrophenyl ester	1	B
Benzoic acid, p-nitro-, ethyl ester	1	B
Benzoic acid, p-nitro-, hydrazide	2	0
Benzoic acid, p-nitro-, isobutyl ester	1	B
Benzoic acid, p-nitro-, isopropyl ester	1	B
Benzoic acid, p-nitro-, methyl ester	1	B
Benzoic acid, p-nitro-, 2-naphthyl ester	1	B
Benzoic acid, p-nitro-, o-nitrophenyl ester	1	B
Benzoic acid, p-nitro-, phenyl ester	1	B
Benzoic acid, m-nitro-, 2-phenylhydrazide	1	B
Benzoic acid, p-nitro-, 2-phenylhydrazide	1	B
Benzoic acid, p-nitro-, propyl ester	1	B
Benzoic anhydride	2	0
o-Benzophenetidide	2	0
p-Benzophenetidide	2	0
Benzophenone, phenylhydrazone	2	B
Benzophenone, semicarbazone	2	B
Benzophenone, 4-amino-, semicarbazone	2	B
Benzophenone, 4,4'-diamino-	2	0
Benzothiazole, 2,2'-dithiobis-	1	B

Footnotes on p. 105

Table 1.—Organic compounds showing no fungicidal action when applied as sprays formulated with and without adjuvants - Continued

Compound[1]	Pounds per 100 gallons	Adjuvant[2]
Benzyl alcohol, alpha-(trichloromethyl)-	1	B
Benzylamine, N-nitroso-N-phenyl-	2	O
Bibenzyl, alpha,alpha'-dibromo-	2	O
p-Bromobenzenesulfonic acid, *p*-nitrophenyl ester	2	O
Butyraldehyde, semicarbazone	2	B
Butyraldehyde, alpha-ethyl-, semicarbazone	2	B
Butyramide, alpha,alpha,beta-,trichloro-	1	B
Butyranilide	2	B
Butyric acid, phenylhydrazide	1	B
Carbamic acid, (2,2,2-trichloro-1-hydroxyethyl)-	1	B
Carbazole, 9-benzoyl-	2	O
Carbonic acid, diphenyl ester	2	A
Catechol	2	A
Centralite	2	O
Chalcone, 4'-methyl-3,4-methylenedioxy-	2	O
Cinnamaldehyde, semicarbazone	2	B
Cinnamamide, N-amyl-	1	B
Cinnamamide, N-anilino-	1	B
Cinnamamide, N-butyl-	1	B
Cinnamamide, N-sec-butyl-	1	B
Cinnamamide, N-isopropyl-	1	B
Cinnamamide, N-propyl-	1	B
o-Cresol, 4,6-dibromo-	2	A
o-Cresol, 3,4,6-trichloro-alpha-(2,3,5-trichloro-6-methoxyphenyl)-	1	B
Crotonaldehyde, semicarbazone	2	B
1,4-Cyclohexanedione, 2,5-bis(*p*-methylphenoxy)-	2	O
Cyclopentanone, semicarbazone	2	B
1,3-Diazaspiro[4,4]nonane-2,4-dione	2	O
Dibenzothiophene, 5-dioxide	2	O
Dibenzothiophene, 3-nitro-, 5-dioxide	2	O
Dibenzylamine, N-[2-(2,4-dinitrophenoxy)ethyl]-	1	B
Dibenzylamine, N-[2-(pentachlorophenoxy)ethyl]-	1	B
Diphenylamine, 3-chloro-2,4-dinitro-	2	B
Diphenylamine, 4-chloro-2,4-dinitro-	2	B
Diphenylamine, N-ethyl-2,4-dinitro-	2	B
Diphenylamine, 2'-methoxy-2,4-dinitro-	2	B
Diphenylamine, 2'-methyl-2,4-dinitro-	2	B
Diphenylamine, 3'-methyl-2,4-dinitro-	2	B
Diphenylamine, 4'-methyl-2,4-dinitro-	2	B
Diphenylamine, N-methyl-2,4-dinitro-	2	B
Disulfide, bis(*o*-nitrophenyl)-	2	A
Ethane, 1-(4-biphenylyl)-2,2,2-trichloro-1-phenyl-	1	B
Ethane, 2,2-bis(*p*-acetoxyphenyl)-1,1,1-trichloro-	1	B
Ethane, 2,2-bis(*p*-bromophenyl)-1,1,1-trichloro-	2	B
Ethane, 1,1-dibromo-2,2-bis(*p*-bromophenyl)-	1	B

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Table 1.—Organic compounds showing no fungicidal action when applied as sprays formulated with and without adjuvants - Continued

Compound[1]	Pounds per 100 gallons	Adjuvant[2]
Ethane, 1,1-dibromo-2,2-bis(*p*-chlorophenyl)-	1	B
Ethane, 1,1-dichloro-2,2-bis(*p*-chlorophenyl)-	1	B
Ethane, 1,1,1-tribromo-2,2-bis(*p*-bromophenyl)-	1	B
Ethane, 1,1,1-tribromo-2,2-bis(*p*-chlorophenyl)-	1	B
Ethane, 1,1,1-trichloro-2,2-bis(5-chloro-2-methoxyphenyl)-	1	B
Ethane, 1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)-	2	B
Ethane, 1,1,1-trichloro-2,2-bis(3,5-dichloro-2-methoxyphenyl)-	1	B
Ethane, 1,1,1-trichloro-2,2-bis(3,5-dichloro-4-methoxyphenyl)-	1	B
Ethane, 1,1,1-trichloro-2,2-bis(3,4-dimethoxyphenyl)-	1	B
Ethane, 1,1,1-trichloro-2,2-bis(*p*-methoxyphenyl)-	2	B
Ethane, 1,1,1-trichloro-2,2-diphenyl-	2	B
Ethane, 1,1,1-trichloro-2,2-di-*p*-tolyl-	2	B
Ethanol, 2,2,2-trichloro-1-(2,4-dihydroxyphenyl)-	1	B
Ether, 4,6-dinitro-*o*-tolyl ethyl	2	B
Ether, 4,6-dinitro-*m*-tolyl methyl	2	0
Ethylene, 2,2-bis(*p*-bromophenyl)-1,1-dichloro-	2	B
Ethylene, 1,1-dichloro-2,2-bis(*p*-chlorophenyl)-	2	B
Ethylene, 1,1-dichloro-2,2-diphenyl-	2	B
Ethylenediamine, N,N'-bis(2,4-dinitrophenyl)-	2	B
2-Furaldehyde, semicarbazone	2	B
9,10[3',4']-Furanoanthracene-12,14-dione, 9,10,11,15-tetrahydro-	1	B
Glycinonitrile, N-*o*-anisyl-	1	B
Glycinonitrile, N-1-naphthyl-alpha-phenyl-	1	B
Glycinonitrile, N-phenyl-	1	B
Glycinonitrile, N-*p*-tolyl-	1	B
2-Heptanone, semicarbazone	2	B
4-Heptanone, 2,3,5,6-tetrabromo-2,6-dimethyl-	2	0
2,5-Hexanedione, disemicarbazone	2	B
Hydantoin, 5-(*p*-chlorophenyl)-5-methyl-	2	0
Hydantoin, 5-methyl-5-phenyl-	2	0
Hydrazine, 1,2-dibenzoyl-1-phenyl-	2	0
Hydrazine, 1-ethoxalyl-2-phenyl-	1	B
Hydrazine, 1-phenyl-2-sulfonyl-	1	B
Hydrazine, 1-phenyl-2-(*p*-tolylsulfonyl)-	1	0
Hydrocinnamic acid, alpha,beta-dibromo-, ethyl ester	2	A
Hydroquinone, diamyl-	2	A
Hydroquinone, dibenzenesulfonic acid ester	2	0
Isobutyric acid, 2-phenylhydrazide	1	B
Isocaproic acid, 2-phenylhydrazide	1	B
Isovalerone, semicarbazone	2	B

Footnotes on p. 105

Table 1.—Organic compounds showing no fungicidal action when applied as sprays formulated with and without adjuvants – Continued

Compound[1]	Pounds per 100 gallons	Adjuvant[2]
Ketone, ethyl methyl, semicarbazone	2	B
Ketone, 4-hydroxy-3-methoxystyryl methyl	2	B
Ketone, methyl propyl, semicarbazone	2	B
Ketone, 1-naphthyl phenyl	2	B
Lauric acid, 4,6-dinitro-*o*-tolyl-	2	0
Levulinic acid, semicarbazone	2	B
Maleimide, N-anilino-	1	B
Morpholine, 4-(3-chloro-2-hydroxybenzyl)-	1	B
Morpholine, 4-(5-chloro-2-hydroxybenzyl)-	1	B
Morpholine, 4-(*o*-hydroxybenzyl)-	1	B
Morpholine, 4-(*p*-methoxy-alpha-thiotoluyl)-	2	B
Morpholine, 4-(*p*-methyl-alpha-thiotoluyl)-	2	B
Morpholine, 4-(*m*-nitrobenzoyl)-	1	B
Morpholine, 4-phenyl-	2	0
Morpholine, 4-(phenylsulfonyl)-	2	0
Morpholine, 4-(alpha-thiotoluyl)-	2	B
Morpholine, 4-(*p*-tolylsulfonyl)-	2	0
2-Naphthalenesulfonamide, N,N-diethyl-	2	B
2-Naphthalenesulfonamide, N,N-dimethyl-	2	B
2-Naphthalenesulfonamide, N-ethyl-	2	B
2-Naphthalenesulfonamide, N-methyl-	2	B
2-Naphthalenesulfonamide, N-propyl-	2	B
2-Naphthoic acid, 3-hydroxy-	2	A
1-Naphthol	2	A
2-Naphthol, 1,1'-methylene-di-	1	B
1-Naphthol, 2-(*p*-nitrophenylazo)-	2	B
2-Naphthol, 1-(*o*-nitrophenylmercapto)-	2	C
2-Naphthol, 1-(*p*-phenylazophenylazo)-	2	A
2-Naphthylamine, N-(2,4-dinitrophenyl)-	2	B
2-Octanone, semicarbazone	2	0
Oleic acid, chlorinated, sulfonated	2	A
Oleic acid, chlorinated, sulfonated, calcium salt	2	A
Oleic acid, sulfonated, barium salt	2	A
Oleic acid, sulfonated, calcium salt	2	A
Oxalic acid, dimethyl ester	2	0
Oxamide	1	0
Oxamide, N,N'-bis(*p*-chlorophenyl)-	2	B
Oxamide, N,N'-dianilino-	1	B
Oxanilic acid, *p*-chloro-, ethyl ester	2	B
Oxanilic acid, 2,4-dichloro-, ethyl ester	2	B
Palmitic acid, 4,6-dinitro-*o*-tolyl-	2	0
2,4-Pentadien-1-one, 1,5-diphenyl-	2	0
2-Pentanone, 4-methyl-, semicarbazone	2	B
Phenol, *m*-amino-	2	A
Phenol, *p*-amino-	2	A
Phenol, *p*-bromo-	2	A

Footnotes on p. 105

Table 1.—Organic compounds showing no fungicidal action when applied as sprays formulated with and without adjuvants - Continued

Compound[1/]	Pounds per 100 gallons	Adjuvant[2/]
Phenol, *p*-tert-butyl-	2	B
Phenol, 4-chloro-2-phenyl-	2	A
Phenol, *o*-cyclohexyl-	2	A
Phenol, 2-cyclohexyl-4,6-dinitro-, methyl ester	2	B
Phenol, 2,4-dinitro-	2	A
Phenol, *p*-(2,4-dinitroanilino)-	2	A
Phenol, 2-methoxy-(2,4-dinitrostyryl)-	2	B
Phenol, 2,2'-methylenebis[4-chloro-, diacetic acid ester	1	B
Phenol, 2,2'-methylenebis[4,6-dichloro-	1	B
Phenol, 3,3'-methylenebis[2,4,6-trichloro-	1	B
Phenol, pentachloro-	2	A
Phenol, *o*-phenyl-	2	A
Phenol, 2,4'-sulfonyldi-	1	B
Phenol, 4,4'-sulfonyldi-	1	B
Phenol, 2,2'-(2,2,2-trichloroethylidene)bis[6-bromo-4-chloro-	1	B
Phenol, 2,2'-(2,2,2-trichloroethylidene)bis[4-chloro-6-nitro-	1	B
Phenol, 2,2'-(2,2,2-trichloroethylidene)bis[4,6-dichloro-	1	B
Phenol, 4,4'-(2,2,2-trichloroethylidene)di-	1	B
Phenoquinone	2	O
Phenothiazine + 100% sulfur	2	C
Phenylacetic acid, 2-phenylhydrazide	1	B
p-Phenylenediamine, N'-(alpha-benzoyl)benzylidene-N,N-dimethyl-	2	O
p-Phenylenediamine, N'-benzylidene-N,N-dimethyl-	2	O
p-Phenylenediamine, N,N-dimethyl-N'-piperonylidene-	2	O
Phenylsulfuramine, S-*o*-nitro-	2	C
Phthalanilic acid, *m*-chloro-	2	O
Phthalonitrile	2	C
Phthalamic acid, N-thiocarbamyl-	2	O
Phthalamide	2	O
1,4-Phthalazinedione, 2,3-dihydro-3-phenyl-	1	B
Phthalide	2	O
Phthalimide, N-anilino-	1	B
Phthalimide, N-benzyl-	1	B
Phthalimide, N-(*p*-bromophenyl)-	2	O
Phthalimide, N-(*m*-chlorophenyl)-	1	B
Phthalimide, N-(*o*-chlorophenyl)-	1	B
Phthalimide, N-(*p*-chlorophenyl)-	2	B
Phthalimide, N-cyclohexyl-	1	B
Phthalimide, N-(2,5-dichlorophenyl)-	1	B
Phthalimide, N-ethyl-	2	O
Phthalimide, N-hydroxyethyl-	1	B

Footnotes on p. 105

Table 1.--Organic compounds showing no fungicidal action when applied as sprays formulated with and without adjuvants - Continued

Compound[1]	Pounds per 100 gallons	Adjuvant[2]
Phthalimide, N-isobutyl-	2	O
Phthalimide, N-isopropyl-	2	B
Phthalimide, N-methyl-	2	O
Phthalimide, N-1-naphthyl-	1	B
Phthalimide, N-2-naphthyl-	1	B
Phthalimide, N-(*m*-nitrophenyl)-	1	B
Phthalimide, N-(*o*-nitrophenyl)-	1	B
Phthalimide, N-(*p*-nitrophenyl)-	1	B
Phthalimide, N-(5-nitro-*o*-tolyl)-	1	B
Phthalimide, N-octyl-	1	B
Phthalimide, N-phenyl-	2	O
Phthalimide, N-propyl-	2	O
Phthalimide, N-*m*-tolyl-	1	B
Phthalimide, N-*o*-tolyl-	2	O
Phthalimide, N-*p*-tolyl-	1	B
Piperazine, 1,4-dibenzoyl-	2	O
1-Piperidineacetonitrile, alpha-(*o*-hydroxyphenyl)-	1	B
1-Piperidineacetonitrile, alpha-(*p*-methoxyphenyl)-	1	B
1-Piperidineacetonitrile, alpha-phenyl-	1	B
Piperidine, 1-(*p*-bromophenylsulfonyl)-	2	O
Piperidine, 1-(2,4-dinitrophenyl)-	2	B
Piperidine, 1-(*m*-nitrobenzoyl)-	1	B
Piperidine, 1-(*o*-nitrophenyl)-	1	B
Piperidine, 1-(*p*-nitrophenyl)-	1	B
Piperidine, 1-(phenylsulfonyl)-	2	O
Piperidine, 1-(*p*-tolylsulfonyl)-	2	B
Piperonal, phenylhydrazone	2	B
Piperonal, semicarbazone	2	B
Piperonyloin	2	O
Prontosil (soluble)	2	A
Propionamide, alpha,alpha-dichloro-	1	B
Propionic acid, 4,6-dinitro-*o*-tolyl-	1	O
Pseudourea, 3-(*p*-acetaminophenylsulfonyl)-2-thio-	2	O
Pseudourea, 3-(*p*-aminophenylsulfonyl)-2-methylthio-	2	B
Pseudourea, 3-(phenylsulfonyl)-2-methylthio-	2	O
Pseudourea, 3-(*p*-bromophenylsulfonyl)-2-naphthylthio-	2	B
Pseudourea, 3-(*m*-nitrophenylsulfonyl)-2-methylthio-	2	B
Pseudourea, 3-(*p*-tolylsulfonyl)-2-methylthio-	2	B
Pseudourea, 3-(*p*-xylylsulfonyl)-2-methylthio-	2	B
Pyridine, 4-nitrophenyl-	2	O
Pyrocatechol, diacetate	1	B
p-Quinone, 2,5-bis(phenylmercapto)-	2	O
p-Quinone, 2,6-bis(phenylmercapto)-	2	O
Quinoxaline, 2,3-dihydroxy-	2	O

Footnotes on p. 105

Table 1.—Organic compounds showing no fungicidal action when applied as sprays formulated with and without adjuvants - Continued

Compound[1]	Pounds per 100 gallons	Adjuvant[2]
Resorcinol	2	A
Rhodanine, 5-(2-furfurylidene)-	2	B
Rhodanine, 5-(3-hydroxy-2-methoxybenzylidene)-	2	B
Rhodanine, 5-(4-hydroxy-3-methoxybenzylidene)-	2	B
Rhodanine, 5-(p-methoxybenzylidene)-	2	B
Rhodanine, 5-(3,4-methylenedioxybenzylidene)-	2	B
Salicylaldehyde, semicarbazone	2	0
Salicylic acid, 5-amino-, hydrochloride	2	0
Salicylic acid, sulfo-	2	A
Salol	2	A
Semioxamazide, 5-butyl-1-phenyl-	1	B
Semioxamazide, 5-ethyl-1-phenyl-	1	B
Semioxamazide, 5-isobutyl-1-phenyl-	1	B
Semioxamazide, 5-methyl-1-phenyl-	1	B
Semioxamazide, 1-phenyl-	1	B
Semioxamazide, 1-phenyl-5-propyl-	1	B
Stearic acid, 2-phenylhydrazide	1	B
Stilbene, 2,4-dinitro-	2	B
2,2'-Stilbenediol, 3,3',5,5'-tetrachloro-	1	B
Stilbene, 4'-methoxy-2,4-dinitro-	2	B
Succinic acid, alpha, beta-dibromo-	1	B
Sulfide, acetonyl o-nitrophenyl-	2	C
Sulfone, bis(p-bromophenyl)-	2	0
Sulfone, bis(4-chloro-3-nitrophenyl)	1	B
Sulfone, phenyl	2	0
Sulfone, p-tolyl-	2	0
Sulfur thiocyanate	2	0
m-Terphenyl	2	0
o-Terphenyl	2	0
Terphenyls (mixed)	2	0
1,3,5,7-Tetroxacyclooctane, 2,6-bis(trichloromethyl)-	1	B
Thianthrene	2	C
Thianthrene, 3,7-dimethyl-	2	C
4-Thiazolidone, 5-(2,3-dimethoxybenzylidene)-2-thio-	2	B
Thymol, 6-chloro-	2	A
Toluene-2,4-diamine	2	0
p-Toluenesulfonamide, N-benzyl-	2	B
p-Toluenesulfonamide, N-sec-butyl-	2	B
p-Toluenesulfonamide, N-cyclohexyl-	2	B
p-Toluenesulfonamide, N,N-diethyl-	2	B
p-Toluenesulfonamide, N,N-diisobutyl-	2	B
p-Toluenesulfonamide, N-ethyl-	2	B
p-Toluenesulfonamide, N,N'-ethylenebis-	1	B
p-Toluenesulfonic acid, 2-naphthyl ester	1	B

Footnotes on p. 105

Table 1.—Organic compounds showing no fungicidal action when applied as sprays formulated with and without adjuvants - Continued

Compound[1]	Pounds per 100 gallons	Adjuvant[2]
p-Toluenesulfonic acid, *o*-nitrophenyl ester	1	B
p-Toluenesulfonic acid, *p*-nitrophenyl ester	1	B
p-Toluenesulfonic acid, *m*-tolyl ester	1	B
p-Toluenesulfonic acid, *p*-tolyl ester	1	B
p-Toluenesulfon-*o*-anisidide	2	B
p-Toluenesulfono-*o*-penetidide	2	B
p-Toluenesulfono-*m*-toluidide	2	B
p-Toluenesulfono-*o*-toluidide	2	B
alpha-Toluenethiol, *p*-nitro-	2	A
o-Toluidine, 4-bromo-	2	A
o-Toluidine, 5-nitro-	2	O
Triazene, 1,3-ditolyl-	2	A
s-Trioxane, 2,4-bis(trichloromethyl)-	1	B
s-Trithiane	2	A
Urea, 1,3-bis(1-hydroxy-2,2,2-trichloroethyl)-	1	B
Urea, 1-(2,5-dichlorophenyl)-	1	B
Urea, 1-(2,2,2-trichloroethylidene)-3-(2,2,2-trichloro-1-hydroxyethyl)-2-thio-	1	B
Vanillin, semicarbazone	2	B
o-Veratraldehyde, phenylhydrazone	2	B
o-Veratraldehyde, semicarbazone	2	O

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[1] The compounds in all tables are named in the inverted form as used in Chemical Abstracts index in order to group together chemically related compounds as far as possible.

[2] O, No adjuvant; A, 2 lb. Wyoming bentonite + 4 lb. hydrated lime; B, 1 or 2 lb. pyrophyllite; C, 4 lb. hydrated lime.

Table 2.—Results of fungicidal and phytotoxic tests with organic chemicals that alone or with adjuvants showed fungicidal activity

Compound	Pounds per 100 gallons	Adjuvant[1]	Days effective during 14-day test period against conidia of –		Injury to Peach
			Monilinia fructicola	*Glomerella cingulata*	
Acetanilide, *p*-chloro-alpha-isonitroso-	2	0	11	11	None
Acetic acid, *o*-chlorophenoxy-	2	0	12	12	Severe
Acetic acid, *p*-chlorophenoxy-	2	0	12	12	Severe
Adipic acid	2	0	6	6	Moderate
Aniline, *p*,*p*'-thiodi-	2	0	14	14	None
Anisic acid	2	0	11	11	None
Benzamide	2	0	14	14	Mild
Benzamide, N-isobutyl-	2	0	12	4	Moderate
Benzene, iodo-	2	A	2	0	Slight
Benzenesulfonamide, N-amyl-*p*-bromo-	2	0	1	1	None
Benzenesulfonamide, N-benzyl-*p*-bromo-	2	0	1	1	Mild
Benzenesulfonamide, *p*-bromo-N-(*m*-chlorophenyl)-	2	0	1	1	Mild
Benzenesulfonamide. *p*-bromo-N-(*o*-chlorophenyl)-	2	0	1	1	Severe
Benzenesulfonamide, *p*-bromo-N-(p-chlorophenyl)-	2	0	1	1	Moderate
Benzenesulfonamide, *p*-bromo-N-(*o*-tolyl)-	2	0	1	0	None
Benzenesulfonamide, N-ethyl-	2	0	9	5	Moderate
Benzimidazole	2	0	11	11	None
2-Benzofurancarboxylic acid	2	B	11	11	Moderate
Benzoic acid, 2-bromo-3-nitro-	1	0	11	11	Severe
Benzoic acid, *o*-chloro-	1	0	9	11	Slight
Benzoic acid, *p*-chloro-	1	0	11	11	None
Benzoic acid, 3,4-dichloro-	1	B	14	14	None
Benzoic acid, 2-phenylhydrazide	2	B	2	2	Severe
2-Biphenylamine	2	0	2	2	None
Cinnamic acid	2	0	11	11	Moderate
Cinnamic acid, 3,4-methylenedioxy-	2	0	2	0	Slight

Table 2.--Results of fungicidal and phytotoxic tests with organic chemicals that alone or with adjuvants showed fungicidal activity - Continued

Compound	Pounds per 100 gallons	Adjuvant[1]	Days effective during 14-day test period against conidia of -		Injury to Peach
			Monilinia fructicola	*Glomerella cingulata*	
p-Cresol, alpha-phenyl-	2	B	14	14	Moderate
Diphenylamine, 2,4,4'-trinitro-	2	B	14	11	Severe
Glycinonitrile, N-(*o*-methoxyphenyl)-	1	B	14	14	None
Hydrazine, 1-phenyl-2-phenylsulfonyl-	2	B	8	8	Slight
Hydrocinnamic acid, alpha,beta-dibromo-	2	0	9	11	Mild
Lauramide, N-butyl-	2	0	9	4	None
Myristic acid, 4,6-dinitro-*o*-cresyl ester	2	0	1	4	Slight
Nicotinonitrile, 6-chloro-2,4-dihydroxy-	1	0	5	5	None
Phenol, *o*-amino-	2	A	6	6	Moderate
Phenol, *p*-benzylamino-	2	B	14	7	Moderate
Phenol, 1,1-cyclohexane-4,4'-bis[2,6-dichloro-1		B	1	1	None
Phenol, 4,4'-isopropylidenedi-	1	B	11	11	None
Phenol, 2,2'-methylenebis[4-chloro-	1	B	14	14	Slight
Phenol, 2,2'-methylenebis[3,4,6-trichloro-	1	B	8	0	None
Phenol, 2,2'-(2,2,2-trichloroethylidene)bis-[4-chloro-	1	B	14	14	None
Phthalic anhydride, 3-nitro-	2	0	0	6	Severe
Propionic acid, 2,4-dinitrophenyl ester	1	0	14	14	None
Propiophenone, *p*-hydroxy-	2	0	6	0	Mild
Stilbene, 2,4-dinitro-3',4'-methylenedioxy-	2	B	14	7	Mild
Triethylamine, 2-pentachlorophenoxy-	1	B	8	8	Severe
o-Veratramide	2	B	7	0	Severe

[1] 0, No adjuvant; A, 2 lb. Wyoming bentonite + 4 lb. hydrated lime; B, 1 or 2 lb. pyrophyllite.

Table 3.—Results of fungicidal and phytotoxic tests with organic chemicals that had previously shown activity, when used alone or with adjuvants, with insecticides or with mixtures of adjuvants and insecticides

Compound	Pounds per 100 gallons	Adjuvant	Days effective during 14-day test period against conidia of –		Injury to peach
			Monilinia fructicola	*Glomerella cingulata*	
Acetic acid, *o*-chlorophenoxy-	2	Lime	0	0	Moderate
Acetic acid, *p*-chlorophenoxy-	2	Lime	0	0	Moderate
Adipic acid	2	Lime	0	0	None
	2	Nicotine-bentonite	0	0	Severe
Aniline, *p,p'*-thiodi-	2	Lime	9	7	None
Anisic acid	2	Lime	0	0	Slight
	2	Nicotine-bentonite	14	14	Very slight
Benzamide	2	Lime	10	6	Moderate
Benzimidazole	2	Lime	9	7	None
2-Benzofurancarboxylic acid	2	Lime	0	0	Severe
Benzoic acid, 2-bromo-3-nitro-	1	Lime	0	0	Severe
	1	Nicotine-bentonite	14	14	Severe
Benzoic acid, *o*-chloro-	1	Lime	0	0	Mild
Benzoic acid, *p*-chloro-	1	Lime	0	0	Moderate
Benzoic acid, 3,4-dichloro-	1	DDT-pyrophyllite	14	14	None
Cinnamic acid	2	None	11	11	Moderate
	2	Lime	0	0	Mild
Phenol, 4,4'-isopropylidenedi-	2	None	11	11	None
Phenol, 2,2'-methylenebis-[4-chloro-	1	Lime	14	14	None
	1	Lead arsenate	14	14	Lead arsenate
	1	Lime-bentonite	14	14	None
Phenol, 2,2'-(2,2,2-trichloroethylidene) bis[4-chloro-	1	None	14	14	None
Propionic acid, 2,4-dinitrophenyl ester	1	Lime	0	0	Severe

Table 4.--Results of fungicidal and phytotoxic tests with 3,4-dichlorobenzoic acid and 2,2'-methylenebis[4-chlorophenol] when used alone or mixed with adjuvants and insecticides

Formulation 1/	Days effective during 14-day test period against conidia of -		Injury to peach
	Monilinia fructicola	Glomerella cingulata	
3,4-Dichlorobenzoic acid plus--			
Pyrophyllite 2 + lead arsenate 2	14	14	Typical of lead arsenate
Pyrophyllite 2 + benzene hexachloride 2	14	14	None
Pyrophyllite 2 + hexaethyl tetraphosphate (1-16000)	14		Severe
Pyrophyllite 1	14	14	None
Polyethylene polysulfide 2 qt.	3	3	None
Polyethylene polysulfide 2 qt. + DDT	6	6	None
Polyethylene polysulfide 2 qt. + benzene hexachloride 2 + phenothiazine 2	9	6	None
Polyethylene polysulfide 2 qt. + DDT 1 + phenothiazine 2	9	6	None
Polyethylene polysulfide 2 qt. + lead arsenate 2	9	6	Typical of lead arsenate
Polyethylene polysulfide 2 qt. + phenothiazine 2 + lead arsenate 2	9	6	Typical of lead arsenate
Polyethylene polysulfide 2 qt. + phenothiazine 2	9	9	None
2,2'-Methylenebis[4-chlorophenol] plus--			
None	14	14	None
Pyrophyllite 1	14	14	None
Lead arsenate 1	14	14	Severe (lead arsenate)
Hydrated lime 2	14	14	None
Lead arsenate 1 + hydrated lime 2	14	14	Mild (lead arsenate)
Hydrated lime 2 + bentonite 1	14	14	None
DDT 1	14	14	None
Starch acetate 1/10	14	14	None
DDT 1 + starch acetate 1/10	14	14	None

1/ Figures indicate pounds per 100 gal. unless otherwise designated.